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ADMINISTRATION

OF

WESTERN PINE BEETLE.

CONTROL PROJECTS.

By

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CONTENTS.

	Page.
Foreword --	1
The Organization of a Project	1
Camp Organization	2
Size of Camps	2
Location of Camps	4
Camp Personnel	4
Spotting	5
The Topographic Method	5
The Strip Method	6
Size of Spotting Crew	6
Supervision of Spotting	7
Selecting of the Trees to be Cut	7
Spotter's Equipment	8
Treating	9
The Burning Method	9
The Sun Curing Method	9
Felling	9
Limbing	9
Peeling	10
Brush Disposal	10
Burning	10
Working Seasons	11
The Treating Crew	12
Treating Crew Equipment	13
Records	14
Tree Data Card	14
Spotting and Treating Record	15
Compassman's plats	15
Progress Map	15
Other Records	15
Cost Records	15
Volume and Bark Surface Tables	16
General Camp Equipment	16
Wages	18
Subsistence	18
Transportation	19
Communication	19
Some Administrative Suggestions	19

APPENDIX

Page.

Table 1 - Size of Camps for Various Intensities of Infestation ---------- 21

Table 2 - Equipment for 22 man Camp ---------- 22

Table 3 - Standard Grub Ration List ---------- 27

Table 4 - Measurements for Construction of Biltmore rule ---------- 31

Table 5 - Western Yellow Pine Volumes ---------- 32

Table 6 - Bark Surface for each Diameter and Height ---------- 33

Table 7 - Bark Surface for Average Diameter and Infested Length ---------- 34

Sample Forms:

- Tree Data Card ---------- 35
- Treating Record ---------- 36
- Treating Plat ---------- 37
- Progress Report ---------- 38
- Section Plat ---------- 39

Index ---------- 40

ADMINISTRATION OF WESTERN PINE BEETLE CONTROL PROJECTS*.

By
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A western pine beetle control project may be defined as an enterprise directed toward the suppression of the western pine beetle on a specific area and operating under a definite entomological plan. It may vary in size from one man working to control the beetles on his own land, to an undertaking contemplating the control of beetles over many square miles, and employing hundreds of men. The two methods which have been generally used are (1) the felling of the trees, burning the bark or exposing it to the sun's heat, (2) selective logging of the infested trees and placing the logs in water; or converting the logs into lumber and burning the slabs.

Aside from entomological considerations, such a project may be a success or failure depending upon the character of its administration. Artificial control is expensive at best and inefficiency in management may very easily result in costs which cannot be offset by the timber saved, while on the other hand, a small change in methods of management may show a profit. The margin between success and failure is often very narrow. Therefore, it is important that the experience gained in the past on such projects as the Southern Oregon-Northern California Project, be made available to workers in this field.

Since infested timber is usually quite inaccessible to logging operations, the burning method mentioned above is the one most commonly used. Therefore, the present paper deals with the administration and organization of projects using the burning method where control is to be applied over considerable area, necessitating the establishing of one or more three to fifty man camps.

THE ORGANIZATION OF A PROJECT.

The organization of a control project naturally divides itself into two parts (1) entomological supervision and (2) control administration.

The entomological supervision may be considered as analogous to the architectural supervision of building construction or the engineering supervision in railway work. Its function is to make the preliminary surveys, draw up the plans, devise the methods, and supervise their application. The

*This manual refers especially to western pine beetle (Dendroctonus brevicomis Lec.) infestations in the yellow pine (Pinus ponderosa) forests of California, Oregon, Washington, Idaho and Montana.

work may either be handled by trained entomologists of the federal or state departments, or in private work, by a man especially trained in insect control work.

Outside of making the plans, the entomologist will usually not be called upon to handle the actual control administration. It is best that he act only in an advisory capacity in such matters as camp organization, camp personnel, and such other problems as have to do with the administration of the work.

The control administration is comparable to that of the building contractor. Following the plans of the entomologist the administrator is chiefly concerned with getting the job done as efficiently, as quickly and as cheaply as possible. This work is usually carried out by the owner of the land, his agent or an organization responsible for the protection of the timber.

On small projects or projects involving only one owner, the administration is usually handled by one executive, such as the Forest Supervisor on National Forests, the Park Superintendent on National Parks, and the resident manager or forester for operating timber companies.

On large projects, where several owners or agencies are involved, a most satisfactory plan is to have the administrative policy handled by a committee or board of directors composed of one representative of each of the cooperating parties. This board makes all decisions for the conducting of the work, such as, the fixing of wages, the organization of camps, the purchase and distribution of supplies and equipment, arranging for communication, cost accounting, methods of slash disposal and similar work incident to the execution of the plan of control. The actual work is then handled thru one executive or manager responsible to the board for the efficiency of his work. If the project is divided into a number of distinct administrative areas, it may be well to have a manager for each area. And under the area managers will be the camp foreman, each in charge of one camp unit.

The most suitable control organization will have to be worked out for each project, but in any case the responsibilities for different phases of the work should be definitely assigned so as to prevent any conflict in authority or duplication of effort.

CAMP ORGANIZATION.

Size of Camps:

Adjusting the size of the control camp to fit the conditions found on any project is a matter which requires very careful planning. A camp either too large or two small to fill the particular needs will affect the efficiency of the work very adversely.

Knowing the acreage to be covered, the number of trees to be treated, the length of the operating season, the rate of treating per man per day and the number of available camp sites, the size of camp which will fit the given conditions, can be easily computed.

First, determine how many spotting crews will be needed to cover the area in the allotted time. Under average conditions, one three-man spotting crew can efficiently cruise one half section per day, (320 acres.) Heavy infestation may cut this down to one quarter section per day and with light infestation they may cruise three quarters a day, but one half section is a safe average. Thus, if 30 square miles are to be covered in a 60 day working period, at a half section per day, it will just require one spotting crew.

Secondly, determine the number of laborers required to treat the total estimated number of trees in the specified time. With the burning method, each man can treat from 2 to 3 trees per day. Thus with 3000 trees to treat in 60 days, it will require 25 men treating 2 trees per day each to do the job.

Thirdly, adjust the laborers and spotting crews into convenient camp units so that the treating will just keep pace with the spotting, or only lag slightly behind. Thus, if the infestation averages 100 trees per section, the spotters will mark 50 trees per day and it will take 25 laborers treating two trees apiece to keep up with the spotting.

By filling in with the other necessary camp laborers, such as foreman, saw filer, cook and helpers, the size of the camp to be used is thus determined.

If it should work out that more than one spotting crew is needed and the number of laborers to go with each spotting crew is small, then it may be best to put all crews in one camp and treat the area at double or triple the rate. This reduces the overhead and gives a more efficient sized camp to manage. However, the point may soon be reached where the cost of frequent moves will offset the saving made thru increased efficiency.

A large camp is more efficient than a small one and has less overhead expense per man. Therefore, plan to have the largest camp that is warranted by the given situation. The size of the camp is usually limited to what one cook can handle. Camps of from 20 to 45 men are efficient working units. Although large camps are desirable it is not well to put in more men than are required to finish the work within the allotted time. Since the working periods are short anyway, the men do not reach their full efficiency until the latter part of the period. Too many men results in a shortening of the working period, with less production per man, and at a higher unit cost.

Table 1, indicates desirable sizes of camps for the handling of various intensities of infestations where the spotting and treating proceeds at the rate of one half section per day.

On a large project with more or less uniform conditions it is particularly desirable to standardize the size of the camps, selecting the size which will best handle the average infestation. In this way coordination is secured between all of the interrelated parts, such as the size of tents, cookstove, length of dinning table, size of motor trucks, etc. It also simplifies the supply problem as the weekly supply for all camps will be practically the same.

Location of Camps:

The considerations which determine the location of camps are: (1) the available water supply, (2) proximity to roads or trails and (3) central location in respect to the working area.

In selecting any site these factors will have to be weighed to determine what location is the most desirable. Often the cost of hauling water or of building roads will have to be weighed against the loss of time where distance of camps from the work makes long walks necessary.

Ordinarily the maximum walking distance should not be greater than 2 miles. This will permit the working of a $12\frac{1}{2}$ square mile area around the camp, and often a block of 9 to 16 sections can be worked without serious inconvenience. However, the topography and timber boundaries will often limit the area which it is profitable to work from one camp site and short moves to eliminate the walking are often desirable.

Camp Personnel:

The camp foreman should be a man not only thoroughly trained in the practical aspects of insect control but particularly well qualified in the art of handling men. He should understand the psychology of labor, know how to apply it, and understand all phases of the work so that he will know whether or not the work is being properly done. The administrative officiency of the work depends largely upon the camp foreman.

The spotters should preferably be active young men with observing eyes and alert minds. They must be ready and willing to do a lot of walking in scouting out the trees and must exercise considerable good judgment in the marking. Familiarity with compass work, pacing and the methods of land survey are an asset. The best training for the spotters is a week or more with the treating crews, where they have an opportunity to observe just what constitutes a "good" bug tree and what type of tree should be passed up. The entomologist should give them considerable training and carefully watch their work to see that the proper trees are being marked and none are being missed.

The compassman should be expert at pacing, neat and accurate in mapping and familiar with the methods of land survey. An accurate map increases the efficiency of the work very materially by reducing the chances of the treating crews missing the trees. A good compassman is an asset but a poor one is a decided liability.

The cook is a most important man in the camp organization. Here again it is false economy to get a poor though cheap cook. He will soon offset the saving in wages by the food he wastes, by the discontent among the men and the consequent decrease in production. If the camp consists of more than six men, a cook is needed. But one cook with a few helpers can also take care of a hundred-man camp. Therefore the larger the camp the less the overhead for cook and helpers.

Where a camp has more than five crews, a saw filer is a necessity. For the smaller camps, often a saw filer can be found to file saws part time and work in the woods when the saws are in shape. Here again a good saw filer is an economy.

Experience has shown that the best type of labor for insect control is the local farmer or wood-cutter type, although any husky man familiar with the use of a saw and axe can be very easily taught the fundamentals of the work. The regular "lumber jacks" have for the most part proved unsatisfactory. They are a highly specialized class of workers and dislike to do the various jobs connected with peeling and burning the bark, which they consider as "out of their line." They also object to the long walks. On account of the walking, usually young men are better fitted for the work than older ones, although many very excellent workers among the older men have been employed in the camps.

SPOTTING*

"Spotting" is the work of locating and tagging the infested trees which are to be cut. It is one of the most important phases of the work, as success depends largely upon finding a high percentage of the infested trees. It is important therefore that the forest should be thoroughly and systematically searched.

There are, in general, two methods of spotting (1) the topographic method and (2) the strip method.

The Topographic Method:

This method is best adapted to country with steep topography and well-defined drainage. It is best handled by one spotter working alone.

*If section lines are difficult to find it will pay to have them re-run in advance of spotting.

The spotter should lay out a definite drainage to be covered each day. By following the ridges or around the contours he works back and forth along the slopes marking all of the infested trees as they are found, and platting them on his map. A good topographic map on a four inch to the mile scale or larger is best for this purpose.

A good pair of field glasses is an aid not only in locating distant trees but in examining those nearer at hand for pitch tubes and sawdust.

With this method, it is difficult to cover the area in a very uniform manner, but it has an advantage in being less expensive than the strip method and can be used in rough country where the strip method is not applicable.

The Strip Method:

The strip method is primarily adapted to flat or gently rolling country or in dense forests where one "cannot see the forests for the trees." Because it is systematic, it is usually more efficient than the topographic method. The extra expense involved can well be afforded by the higher percentage of trees found. A three man crew can best handle the spotting by this method.

One man acting as compassman carries the line with compass and pacing back and forth thru a section, plats the infested trees and maps the topography. The spotters work in a strip on either side of the compassman and mark and tally all of the infested trees requiring treatment. In fairly open stands a five chain or "tally" strip can be satisfactorily handled by each spotter. If the timber is dense or the infestation particularly heavy or hard to locate (as in fall work) the width of strip should be cut to four or even to two chains. In no case should the spotting of a strip greater than five chains be attempted by one spotter, as the percentage of missed trees is certain to increase.

The advantages of this method are the thorough and uniform spotting of the entire area; the accurate mapping of the infested trees which prevents loss of time for the treating crews and the systematic working of the area so as to prevent any "back tracking" by the treating crews.

Size of Spotting Crew:

The size of the spotting crew will vary with the amount and intensity of infestation in the area and the spotting method to be used.

One spotter can best handle the work by the topographic method, marking and mapping the trees as he goes. If the infestation is light and

only a small treating crew need be provided for, one spotter can use the strip method in a fairly satisfactory manner. Then again for very heavy infestations, where a man can go out and in a half day mark up enough trees to keep the camp busy, spotting is best accomplished by one man.

With a two man crew, one man acting as compassman, very little more country can be spotted than with one man working alone (only one spotter in either case) and it is twice as expensive.

A three man spotting crew is the most satisfactory for the average epidemic infestation of the western pine beetle in a country of modorately steep to flat topography.

Nothing can be said in favor of a four man spotting crew. It should be avoided as both expensive and inefficient. The crew attempts to cover too much territory. The outside men are so far from the compassman that they are unable to keep in touch with him and are usually unable to tell the direction of the strip or estimate its proper width. As a consequence some territory is covered too intensively and the rest not at all.

On the whole, for practically all infestations of the western pine beetle which are aggressive enough to warrant artificial control methods, a three man crew using the strip method will give the most satisfactory spotting results.

Supervision of Spotting:

The spotting crew should be administratively responsible to the camp foreman for their work -- where, when and how much. In addition they should be held accountable to the entomologist for the technical character of their work, i.e. the kind of trees they mark for treatment.

Selection of the Trees to be Cut:

All yellow pines with sickly or slightly fading to sorrel foliage; trees showing signs of woodpecker work, or pitch tubes, frass or sawdust in the bark, or with large pitch tubes at the base should be visited and examined for the presence of the western pine beetle,

The preliminary examination should be confined to slicing the outer bark, to determine if there are entrance or ventilating holes running thru to the cambium. This avoids injury to the healthy trees by promiscuous hacking and blazing and is all that is necessary to determine if it has been attacked at the base. If the tree has been attacked then it is well to sample it thoroughly enough to determine how successful the attack has been and to what stage the beetles have developed.

Trees to be Marked for Treatment: are standing trees and windfalls over twelve inches in diameter containing live broods of the western pine beetle in the stage of larvae, pupae, or first new adults not yet emerging.

Trees not to be Marked for Treatment: are those (1) under twelve inches in diameter (unless in groups) (2) showing only doubtful evidence of the western pine beetle or partially attacked trees containing broods only in the egg stage, (3) from which the broods have started to emerge (4) very remote from control operations so that their treatment would be excessively expensive. From recent experience, the conclusion has been reached that it does not pay to carry on operations in the spring after the beetles have started to emerge.

Spotter's Equipment:

The equipment for the spotting crew should include:

For the Compassman:

1. Geologists compass, with staff.
1 Tally register.
1 Map of area,
(blank section forms 4" to the mile)
1 Aluminum holder for forms
1 Pencil (4H) and eraser.
1 Carrying Case
1 Army Canteen, quart size.

For each Spotter:

1 U.S. Marking hatchet or light freighter's axe.
1 Aluminum cover for spotting record forms
1 Timber crayon
1 Pencil (4H) and eraser.
1 Carrying Case
1 Army Canteen
1 Diameter tape or Biltmore Rule.
Tree data card tags, and spotting record forms.
Tacks.

Where great accuracy in diameter measurements is not required, a convenient device for the spotter is a Biltmore rule laid off on his axe handle, with a little practice, measurements can be taken to the nearest two inches. The measurements used in laying off such a scale are given in table #4 of the appendix.

If working alone, the spotter should, in addition to the above be provided with Compass, Tally register, Base map and, if using the topographic method, a pair of field glasses.

TREATING.

"Treating" is the work of destroying the infesting broods of destructive barkbeetles. The two principal methods in artificial control are (1) the burning method and (2) the sun curing method.

The Burning Method:

The burning method consists of felling the infested trees; peeling the bark from the top half of the log, throughout the infested length; piling this bark along the side of the log and then burning it. It is best employed during the late fall, winter and early spring.

The Sun Curing Method:

With the "sun curing" or "solar heat" method, the trees are felled, as in the burning method, all of the infested bark is removed from the main trunk and is spread on the ground so as to be reached by the direct rays of the sun. It was recently found that where daily temperatures during the summer reached 85° or more, bark temperatures were reached which were fatal to the beetles in all stages. This method while applicable to summer control in regions of high summer temperatures, is more expensive than the burning method and is usually not as efficient in securing a high degree of brood mortality.

Felling:

Wherever possible, the tree should be felled in an open place where its treatment will cause the least damage to reproduction and standing timber. On hillsides the tree should preferably be felled down hill or up hill rather than on the contour. "Bedding" the log, that is, keeping if off the ground, is usually advantageous in the sun curing method and sometimes desirable where burning conditions are unfavorable and it is necessary to place pitch and dry material along the underside of the log to insure complete burning of the bark.

Limbing:

Such limbs as will interfere with the peeling work should be cut off close to the trunk. It is easier to cut a limb close to the trunk than to leave a stub and it saves barked knuckles. When using the burning method, it often saves time in peeling and makes a cleaner job to cut off the top and bring it back along the trunk, in this way the top is completely burned and considerable bark also destroyed which would otherwise have to be peeled.

Peeling:

All infested bark on the top half of the log to well down on the sides should be removed and stacked along the log. The peeling should continue as far into the tops as infestation is to be found, or far enough so that the burning of the tops, brush and limbs will destroy the bark in the remainder of the trunk. Infested bark on the stump should be peeled and piled on the log to burn.

In the sun curing method, all of the infested bark is peeled from the log and each piece laid out in the open where it will receive the direct rays of the sun, or if the log itself is in the open the bark on the top quarter of the log is left unpeeled.

Brush Disposal:

In wet weather, the limbs and brush should be piled over the log, after the trunk has been peeled and burned with the bark. In late spring or early fall, when the forest is dry, the brush should be scattered outside of the fire lines and kept out of the fire. If there is a certainty that it will be burned later, the brush should be piled in compact piles to save additional handling.

Burning:

The fire should be large enough to completely burn all of the infested bark, and yet not so large as to make it difficult to control or to cause damage to adjacent standing timber. This can largely be regulated by the amount of material left within the fire line.

Under wet conditions it is often necessary to place pitch and other dry material along the trunk, in order to secure a satisfactory burn.

As the ground cover dries out a fire line becomes necessary and should be constructed just as soon as there is any tendency for a fire to remain active over night. It should be constructed as close to the tree as is compatible with safety in burning. The line itself should be a cleared path, at least two feet wide, raked or shoveled down to the mineral soil and should completely encircle the tree, but exclude the stump. This precaution is advisable since many predaceous insects pupate in the soil at the base of trees containing advanced broods of the beetles and by preventing the burning of the debris around the stumps these insects are saved. To prevent basal injury to standing live trees within the fire line all needles and debris at the base of such trees should be removed.

Under very dry conditions, fires should be started on the uphill or leeward side of the trees on the edge of the fire line and the tree burned by "back firing" down the hill or against the wind. Under these conditions it is often best to burn the trees only in the early morning or late evening when the wind does not add materially to the fire risk.

When burning of the tops and limbs will cause injury to standing trees it is best to run the fire line under the log so as to exclude this part of the tree and construct the line close to the tree so that only the infested bark will be burned. In this case the fire should be started at the point where the line crosses under the log so that it may be made certain that the fire does not jump into the top before the tree is left unguarded.

By regulating the amount of material to be burned and the width of the fire line, burning can be done at any season of the year and on the most hazardous areas without injury to the rest of the forest.

Allowing fires to escape is usually an indication of careless or poorly planned work. It takes, however, considerable experience and skill to burn during dry weather without danger to the forest and new crews must be given a great deal of supervision. Therefore the plan of having special crews do the burning where the situation is at all hazardous and the bulk of the labor is inexperienced in control work, is a good one.

Working Seasons:

Work against the western pine beetle has been undertaken at all seasons of the year.

Some work has been conducted during the summer by using the sun curing method or by using the burning method with extra fire precautions. However, such work has not been found to be very satisfactory. Only a small percent of the attacking broods can be found, and the destruction of these has apparently had but little effect in checking the beetle losses.

Fall work has the advantages of less administrative difficulties, easier transportation, less trouble with fires and in addition has proved to yield better results in the control of the beetles. Since most of the infested trees are green at this period, the chief disadvantages are greater difficulty in spotting the trees and in peeling them. However, it has been found that with trained spotters where 85% of the infested trees will be spotted in the spring work, 70% will be spotted in the fall.

Winter work from an entomological standpoint is entirely satisfactory. A good kill of the beetles can be secured even with many feet of snow on the ground. However, because of transportation difficulties it is more expensive than work at other seasons, and as a general thing should only be attempted with a few trained men.

Spring work has been most commonly adopted in control projects. A higher percentage of infested trees can be located then than at any other time. The trees are also much easier to peel since the broods are in an advanced stage of development. However, these advantages may be offset by the number of beetles which escape from the trees with the first warm weather, and the greater difficulty in handling the fires as summer approaches. Transportation is also usually more difficult in the spring because of the saturated condition of the ground.

In general, it may be said that the best time to do control is during the period of beetle inactivity, either during the late fall, winter or early spring.

The Treating Crew:

The usual size of the treating crew is either a two or a three man crew.

A two man crew is best suited to treating work where fire lines do not have to be constructed. Where this sized crew can be used, it is preferable to the three man crew.

It is not difficult to divide the men into congenial pairs, "partners" or men of equal ability. This makes for efficiency. It is also easy to tell if any man is loafing on the job, as the results will quickly show.

A three man crew is best adapted to the treating work when fire lines have to be constructed. After the tree has been felled and peeled the third man takes care of the burning while the others proceed to the next tree and fell it. The third man is needed in this case to assist in carrying the extra fire tools. It is, however, more difficult to determine whether or not each man in a three man crew is doing his full share, as the results are not so evident as with a two man crew.

Working the men in large crews is not desirable.

When the infestation is heavy and the crews can be worked close together, a system of dividing the work into specialized jobs has proven very satisfactory. Under this system, expert timber fallers do the felling

of the trees, buckors and limbers do their part, a peeling crew removes the bark and then a fire crew comes in to handle the burning. A high degree of efficiency can be secured by this system but it cannot be used if the trees are scattered and difficult to find, because of the increased walking time involved.

Treating Crew Equipment:

Each three man crew should be provided with-

1 Falling saw 6½' (4 cutters to one raker) and handles.
3 Double bitted swamping axes, (3½ to 4 lbs.)
1 Sledge (4 lbs.)
2 Small falling wedges (3½ to 4 lbs.)
1 Pocket carborundum stone.
1 8 inch file.
1 Bottle coal oil.
3 Canteens or water bags.
1 Shovel or fire rake.
Timber crayon and lead pencil.
Matches.

For a two man crew the necessary deductions can be made.

Saws - In addition to one falling saw for each crew, at least two extra saws should be provided for each camp so that dull saws can be filed without interfering with the work. The best type of saw for the work is the falling-saw pattern having four teeth to one raker. In some places where very large timber is occasionally encountered, at least one seven foot saw should be available in each camp. Otherwise six foot saws for timber averaging around 20 inches D.B.H. and six and a half foot saws for 30 inch timber are the best sizes.

Axes - A double bitted axe is the best all around tool for treating work, with a pattern somewhere between that of a falling-axe and a swamping-axe. The three and three quarter poind axe is the best average weight, although a few four pound, and three and a half pound axes should be available in each camp for the men who prefer them. Some expert peelers curve the handle by steaming them, and are able to remove large sections of bark with a single blow.

Spuds - Barking "spuds" have been used to some extent where the bark does not stick too tightly to the trees. These consist of a short, slightly curved piece of steel about three inches wide and a foot long, sharpened on one end and set into a short stout handle.

But since an axe has to be carried anyway, the barking spud usually is not of enough value to bother with as an extra tool.

Wedges - The thin three and a half to four pound falling wedges are the best for the purpose. Each treating crew should carry two of these.

Sledges - The sledge hammer does not often come in for heavy service and so should be as light as possible. The four pound sledges are usually considered heavy enough.

Carborundum Stones - The circular pocket stones are the best.

Files - Eight inch flat files, with one round edge, should be purchased for the use of the saw filer and when slightly worn can be given to the treating crews for use in touching up their axes if nicked by rocks or pitch knots.

Fire Rakes and Shovels - Fire rakes should be the lighter make of iron asphalt rakes. The long handle round point shovels are the best for constructing fire lines where the rakes cannot be used.

RECORDS.

The records to be kept will depend upon the requirements of each project. In any case the following records will be desired, (1) the number of trees cut (2) the diameter breast high and number of merchantable logs in each tree (in order to compute the volume) (3) the acreage covered, and (4) the cost. In some cases it is also desirable to know; the location of the trees by legal subdivisions; the name of the owner; the diameters and length of the infested portion of the tree; the species of insects infesting the tree other than the western pine beetle; the condition of the broods; the length of time spent in treating each tree; the amount of woodpecker work; abundance of predaceous or parasitic insects and similar notes.

Tree data Card:

A 3" x 5" card has been designed for use in control projects, with this data listed conveniently for checking. The cards are numbered serially and are tacked to the infested trees by the spotters. The tree is blazed and numbered accordingly at the same time. When the trees are treated the treating crew removes the card and brings it to camp as a record of their day's work. A sample of this card is given in the appendix.

Spotting and Treating Record:

A form is carried by the spotter on which he lists the trees as they are spotted and puts down their serial number, diameter of the tree breast high and number of logs. (See Appendix) Later when the trees are treated and the cards brought to camp, these are checked off on the record and serve as a record of the amount treated and also indicate if any spotted trees have been missed.

In some cases, as when the crews are paid on a contract basis, it is necessary to have another form on which are listed the trees treated by crews. This can be compiled from the cards as they are brought in.

Compassman's Plats:

Blank section plats on an eight inch to the mile scale are the best forms for use in mapping the location of the infested trees. (see sample form in appendix) Trees should be shown by number. It is also well to show the topography, timber types, roads, trails, springs, fences, etc. as a guide to the treating crews in relocating the trees. At night the compassman makes a copy of the map for each treating crew assigned to that section.

Progress Map:

The camp foreman should keep up to date a progress map, preferably on an inch to the mile scale, showing the area spotted, the area treated and the number of trees treated on each section, or for each forty. From this, the progress of the work can be easily determined.

Other Records:

Other records should include a diary of the work; time slips of the men; a record of meals served at the mess house; man-days of treating crew labor, man-days of spotting labor and total man-days for the camp as taken from the time slips, and such other records as the administrative officer may designate.

Cost Records:

Ordinarily the camp organization will not be called upon to keep a record of the costs. This is done at the central office, where the bills are vouchered. In this connection it is desirable to have the cost records segregated by camps and under the following headings:

(1) salaries and wages (including salary of the area manager but exclusive of general administrative or entomological supervision), (2) subsistence supplies, (3) transportation, (including current cost of operation plus a depreciation charge in transportation equipment) and (4) equipment (a depreciation charge should be entered against the cost of the work for equipment of a more or less permanent nature, such as tents, axes, saws, etc., rather than charging the original cost. A more detailed segregation of costs may be made if desired but ordinarily the above four subdivisions are sufficient.

Volume and Bark Surface Tables:

For computing the volume in board feet of the infested timber a volume table computed for the given locality should be used, if such a table is available. For most of the area thru California and Oregon where control of the western pine beetle has been undertaken, the volume table computed by the Forest Service for the Lassen, Plumas, Sequoia, Shasta, Stanislaus and Trinity National Forests of California has been found to be generally applicable. For convenience, this table is given in the appendix.

The best practical unit for measuring the quantity of infestation is the area of infested bark surface. Knowing the diameter of the trees and the total height, this can be roughly computed from Table #6 given in the appendix. When the actual infested length, the diameter of the base and the diameter of the top of the infested portion is known, then the bark surface can be computed much more accurately by using Table #7 in the appendix, which is based on infested length and average diameter of the infested portion.

GENERAL CAMP EQUIPMENT.

Having determined the size of camp best adapted to the project in question, this becomes the "standard camp" and the next problem is to decide as to the kind and amount of equipment needed and adjust all of the various items so that they will best meet the particular need. The object here should be to furnish the camp with everything that is essential and with nothing that can be dispensed with; to cut the weight down to a minimum and to secure articles that will nest and take up the least possible space. Since camps have to be frequently moved, a little thought given to the equipment will save lost time and extra expense. Also if every article of camp equipment is on hand when the camp starts, it will save much lost motion and grief later on. It is hardly advisable to attempt to discuss all of the variations which can be made in equiping camps, a few suggestions, however, may be helpful.

Tents:

The size of tents to be selected will vary from small tents for

small camps to big tents for the large camps. For large camps it is best to increase the size of the tents rather than their number. The 10 x 12 tents will accommodate four men and the army pyrmadel tents eight men each without undue crowding. Where transportation is an important factor, tents should be of the lightest duck consistent with durability. With motor transportation, weight gives way to serviceability as the first consideration.

For the cook tent, a tent of white 10 oz duck with high walls is preferable. Its size will depend upon the number of men to be accommodated. For a large camp two tents, one dining and one cooking tent, is desirable. One 16' x 20' tent can be made to accommodate an eighteen man camp as a combined cooking and dining tent, but two tents are more satisfactory.

Stoves:

The cook stove should combine adequate top and oven space with lightness, compactness and durability. The army field range is an excellent stove for the purpose. It "nests" and is comparatively light. It can be used satisfactorily for camps ranging between 10 to 50 men. Other types of sheet iron stoves are best adapted to smaller camps. For small camps, where the transportation is a limiting factor, open fires and dutch ovens can be used.

For heating the men's tents, nesting sheet iron stoves with flat tops of sibley stoves are very satisfactory. These stoves should be equipped with six lengths of stove pipe which can be reversed and telescoped to prevent damage in packing.

Cooking Outfits:

Cooking outfits which will "nest" should be selected and the whole set kept down to the least possible bulk and weight.

For a dining table top, a handy device is made with a strip of 36" canvas, on which at half inch intervals laths are nailed. This is then covered with oilcloth and makes a very convenient table top of any length desired which can be rolled up and easily carried when moving camp.

Grindstone:

A good grindstone is preferable to the emery wheels for sharpening of axes and one should be furnished to each camp unless transportation makes it difficult to do so.

Record Box:

Regardless of the size of the camp a box should be provided for the safe keeping of the records. With very little trouble a box can be made with shelves or pigeon holes of the proper size to accommodate the various record forms, and the cover so arranged that when open it serves as a writing desk.

The equipment lists used for twenty man camps on the Southern-Oregon-Northern California Project in 1922 are appended to indicate the articles which should be considered in making up equipment lists for control camps.

WAGES.

The foreman, cook, cook's helpers and spotters are usually paid on a monthly basis; the others on a day basis.

Bonus systems of paying the men on the basis of the amount of work accomplished have been tried but on account of the difficulty in securing proper attention to the fires they have not proven altogether satisfactory.

SUBSISTENCE.

The subsistence problem will vary considerably with the type and size of camp, the character of the transportation and the whims of the cook.

The men require good substantial food, well cooked and in sufficient quantity and with a reasonable amount of variety. For the sake of economy the use of canned goods had best be cut to the minimum and fancy brands of groceries avoided and fresh meats and vegetables supplied whenever possible.

The supply list used on the Southern Oregon-Northern California project is given in Table 3 as a suggestion of what is needed.

The work is usually far enough from camp so that midday lunches can be taken instead of having the men come to camp for dinner. In this connection it has been found that the most economical and satisfactory procedure is for the men to put up their own lunches from cooked foods set out on a serving table by the cooks. In this way each man can get just what he wants, both as to items and quantity.

TRANSPORTATION.

The transportation problem will vary from the use of pack animals, to team and wagons or motor trucks depending upon the local conditions. The cost of hiring the transportation on a contract basis versus the purchase of motor trucks or other alternatives should be carefully weighed to determine what in the long run will be the most economical.

If pack stock is used the number should be cut to the minimum as there will be very little work for them after the camps have been established.

Teams are less expensive than motor trucks, but their use is limited to the moving of camps and the hauling of supplies. For a small camp they are often very satisfactory.

If motor trucks can be used, they have the advantage of speed in the moving of camps and supplies and between times can be used advantageously in transporting the men to the more distant parts of the work. In this way, from one camp set-up considerable more acreage can be covered than if the area was limited to what could be reached by walking.

On a large project with operations extending over more than one season, it will undoubtedly pay to purchase motor trucks, if they can be used advantageously. The lighter trucks with capacities of 1500 to 2000 pounds and speeds up to 35 miles per hour are very suitable for this work. The use of the trucks should be carefully watched by the area manager to see that they are not used more than is necessary. One trip to town per week for supplies is ample, provided the cooks are trained to anticipate their needs a week in advance.

COMMUNICATION.

It is very desirable to have telephone communication between camps and the central office. If telephone lines run within three or four miles of the camp this can be arranged by using the light emergency telephone wire and the portable field telephones used by the Signal Corps. It is probably not worth while to put in telephones if the existing lines cannot be reached within the three or four miles radius.

SOME ADMINISTRATIVE SUGGESTIONS.

Do not attempt control unless a large area can be completely covered during the available field season.

Before starting the work make a complete plan, so that every item will be provided for, Make complete lists down to the smallest item, of all camp equipment to furnish one standard camp. Be sure all items are available before assembling the equipment, then upon assembling, check against the lists to be sure that nothing is missed.

Large camps are more efficient than small ones. Therefore, plan to have the largest camp that is warranted by the given situation, rather than several small ones.

Plan the work so the treating will progress uninterruptedly from one side of the project area to the other. Do not skip around from one section to another as this causes a lot of lost motion, extra work for the men in carrying their tools over unprofitable distances, and will result in leaving little patches of work to be cleaned up at considerable extra expense.

Plan the work so that it will progress towards the next camp site. When moving day comes the crews will be at the furtherest edge of the old territory and can easily walk in from work to the new camp site. This prevents time from being lost in the field due to the moving, and avoids the expense of transporting the men by trucks.

Avoid too many bosses. The men should receive instructions and take orders only from the camp foreman. The area manager, the spotters, and the entomologist, and others should refrain from making any comments directly to the men when they are observing the work or inspecting it. All changes should be taken up thru the camp foreman, otherwise, a good deal of confusion will result and the men will not know whose advice to follow.

APPENDIX

Tables and Sample Forms.

TABLE NO. 1.

SIZE OF CAMPS FOR VARIOUS INFESTATIONS
OF
WESTERN PINE BEETLE.

On the Basis of Treating One Half Section per Day.

Personnel of Camp	Average Infestation per Section to be Treated - Trees.														
	Less than 10	10	20	30	40	50	60	80	100	120	140	160	180	200	Over 200
	Number of Men Needed.														
Foreman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spotters	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2
Compassmen	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Saw filers	0	0	0	0	1	1	1	1	1	1	1	2	2	2	2-3
Cooks	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cook's helpers	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2-3
Laborers	2	4	6	8	10	12	14	16	20	24	28	32	36	40	40-90
TOTAL MEN	3	7	9	11	16	18	20	23	27	31	35	40	45	49	50-100

NOTE: 1. Packers, teamsters, or truck drivers not considered as a part of the camp organization.
2. For infestations of less than 50 trees per section, it is often more economical to double the size of the camp and treat one section per day; thus cutting down the overhead for foreman, sawfiler and cook.

TABLE #2.

Equipment for 22 Man Camp
Used on
Southern Oregon-Northern California Pine Beetle Control Project.
During 1922-23-24.

GENERAL CAMP EQUIPMENT.

1 Box for cooking utensils (283" x 3' x 1'3") outside dimensions with 2 shelves, rope handles, detachable hinges and hasp.

1 Box for records, 10" x 15" x 24" outside dimensions.

22 Cots, army steel, folding 2'6" x 6'6".

1 Cover, leather 874C U.S.F.S. (Time sheets and diary)

1 First Aid Kit, U.S.F.S. standard.

24 Files, 8" flat, one round edge

1 Grindstone, or emery wheel.

1 Hammer, claw

55 Lbs. hay wire.

8 Lanterns, standard #2 cold blast.

24 Mattresses, 3' x 6'6" cotton slab.

10 Lbs. Nails, assorted.

1 Pick mattock

1 Saw, light carpenters hand

1 Saw, filing set

1 Stove, cooking range with pipe

4 Stoves, sibley 24", 24 gauge.

4 Stoves, sibley sets of pipe, 6 lengths, tapered to telescope.

4 Stoves, sibley, dampers.

TABLE #2 (Cont'd.)

1 Table top, with oilcloth.

2 Table poles, 18' long.

4 Tents, army squad 16' x 16' with poles.

1 Tent, cook, 16' x 20' 10 oz duck 4' wall.

6 Wash basins

2 Wash tubs

1 Wash board

TREATING CREW EQUIPMENT(2 man crews)

20 Axes, double bitted, hand made, $3\frac{3}{4}$ lb. swamping pattern.

6 Axe handles, D.b.

10 Bottles, pint, for coal oil.

8 Canteens, gallon blanket covered

8 Carborundum stones, round pocket.

8 Rakes, asphalt lightest weight.

10 Saws, $6\frac{1}{2}$ ft. falling (4 cutters to one raker)

10 Pr. saw handles.

8 Shovels, L.H.R.P.

8 Sledges, 4 Lb. flat face.

6 Sledge handles

16 Wedges, flat, thin, 4 lb. falling.

SPOTTING CREW EQUIPMENT(3 men)

3 Axes, light pole or U.S. Marking hatchet.

3 Cantens, 1 qt. Army.

3 Carrying Cases, canvas U.S.F.S.

TABLE #2 (Cont'd.)

2	Compasses, geologists with socket joint and carrying case.
1	Compass staff, Jacob.
3	Covers, aluminum for record forms
2	Diameter tapes
2	Tally Registers.

SPOTTING AND OFFICE SUPPLIES.

24	Pencils, 4 H
24	Erasers, ruby
24	Timber crayons, black or blue
2	Lb. Tacks.
500	Tree Data cards
500	Envelopes for cards
1	Pad section plats 8" to mile
1	Pad section forms (compassman)
60	Spotting records
1	Pad, treated tree record forms
10	Weekly progress report forms
2	Maps of area ($\frac{1}{2}$" to mile)
10	Township plats (1" to mile)
1	Ownership maps
2	Volume tables
100	Time sheets
50	Diary sheets
1	Triplicate order book
	Pen, ink, blotters, and carbon paper.

TABLE #2 (Cont'd.)

KITCHEN EQUIPMENT.

1	Alarm Clock	1	Fry Pan, 12"
1	Brush, scrub	2	Pans, dish, 17 qt.
1	Broom	3	Pans, milk
1	Can Opener	1	Pan, drip, large
1	Chopper, food	2	Pans, drip, small
1	Cleaver	1	Pan, roasting
1	Corkscrew	2	Pots, 4 qt.
2	Dippers, 1 qt.	4	Pails, 14 qt.
1	Doughnut cutter	12	Pie tins
1	Flour sifter	1	Potato masher
1	Kitchen fork	2	Pot,coffee, 3 Gal.
1	Funnel	1	Rolling pin
2	Gem tins	1	Strainer, china cup
1	Grater	1	Saw, meat
2	Knives, butcher	3	Spoons, stirring
2	Knives, paring	1	Steel, butcher's
1	Ladle, strainer, deep	1	Scoop, baker's
1	Ladle, skimmer	1	Roll screen
1	Ladle, solid deep	1	Wool sack
1	Pancake turner	4	Pot covers
3	Fry pans, 14"		

TABLE #2 (Cont'd.)

TABLE EQUIPMENT.

6	Bowls, 4 qt.
6	Bowls, 3 qt.
5	Bowls, sugar
25	Bowls, soup
25	Cups
30	Forks
30	Knives
4	Pitchers, syrup
4	Pitchers, water
30	Plates
4	Coffee Pots, 4 qt.
30	Saucers
36	Spoons, tea
36	Spoons, table
6	Shakers, salt and pepper
3	Platters, deep.

TABLE #3.

STANDARD "GRUB" RATION FOR 20 MEN FOR SEVEN DAYS.

(As used in Pine Beetle Control Camps on S.Ore.-N.Calif. Project.

during operations of 1922)

Meat Products	Units in which Usually Supplied	Amount
Bacon	Side	10 Lbs.
Beef	Quarter	77 "
Ham	Each	27 "
Lard	Lb.	10 "
Mutton	Side	2 "
Pork	Side	3 "
Salmon	#2 Cns.	1½ Cns.
Dairy Products		
Butter	Lb.	12 Lbs.
Cheese	Lb.	5 "
Eggs	Cs. (30 Dz.)	23 Dz.
Milk	Cs. (48 Talls)	54 Cns.
Sugar, White	50# sks.	57 Lbs.
Grain Products		
Cornmeal	10# sks.	2 Lbs.
Crackers	3½# box	1½ "
Flour, Graham		1½ "
Flour, White	49# Sack	88 "

TABLE #3. (Cont'd.)

Grain Products (Cont'd.)	Units in which Usually Supplied	Amount
Germoa	10# sack	2½ Lbs.
Macaroni	Lb.	2½ "
Rice	Lb.	3 "
Rolled Oats	10# sack	3 "
Middlings	10# sack	1 "
Fresh Vegetables		
Onions	Lb.	8½ Lbs.
Potatoes	"	74 "
Carrots	"	5 "
Cabbage	"	8 "
Parsnips	"	4½ "
Beets	"	1 "
Rhubarb	"	3 "
Spinach	"	2 "
Dried Fruits and Vegetables		
Apples	26 Lb. Box	4½ Lbs.
Beans, Bayo	Lb.	3½ "
Beans, White	Lb.	4 "
Peaches,	25 Lb. box	6 "
Prunes	25 " "	6 "
Raisins	25 " "	6 "

TABLE #3 (Cont'd.)

Canned Vegetables	Units in which Usually Supplied	Amount
Beans	Case, 24 cns. 2s	2 Cns.
Corn	Case, 24 cns, 2s	4 "
Hominy	#2½ Cns.	1½ "
Peas	Case, 24 cns. 2s	4 "
Pumpkin	#10s cns	1 "
Tomatoes	#10s cns.	2 "
All Other Foods		
Apple butter	#10s Cns.	½ Cns.
Allspice	2 oz Cns.	
Baking Powder	5 Lb. Cns.	1-2/3 Lbs.
Catsup	Pt. Bottles	1 Gal.
Chocolate	5 Lbs. Cns.	2 Lbs.
Cinnamon	8 oz. Cns.	1 Oz.
Cloves	4 oz. Cns.	1 Oz.
Coconut	1 Lb. Pkgs.	½ Lb.
Coffee	5 Lb. Cans.	6 Lb.
Cornstarch	1 lb. Pkgs.	1 Lb.
Extract, lemon	8 oz. bot.	1½ Oz.
" vanills	6 oz. bot.	1¾ "
Ginger	4 oz Can.	2 Oz.
Mapeline	4 oz. bot.	½ Oz.
Molasses	#2½s Cns.	½ Cn.

TABLE #3 (Cont'd.)

All Other Foods(Cont'd.)	Units in which Usually Supplied	Amount
Nutmeg	4 oz cns.	3 oz.
Mustard	4 " "	2 "
Pepper, Blk.	1 Lb. cn.	3 "
Pepper, Red	2 Oz. cn.	1½ Oz.
Pickles	1 Gal. Keg.	2 Qt.
Sage	2 Oz. can.	1 Oz.
Tapioca	Lbs.	1 Lb.
Salt	# Sks.	5 Lb.
Tea	1 Lb. Pkgs	2/3 Lb.
Vinegar	1 Qt. Bot.	1 Qt.
Yeast, Magic	Bx. of 18	2½ Pkgs.
Sundry Supplies		
Lime Chloride	1 Lb. Cn.	½ Cn.
Matches	5 Pkg. Cartons	5 Bxs.
Oil, coal		1-2/3 Gal.
Soap, laundry	Bar	5 Bars
Soap, hand	Bar	3 "
Soap, powder	2½ Lb. Pkg.	1 Pkg.
Wessen Oil	Pt. Cns.	1 Pt.
Paper Sks.	1000's	
Paper Napkins	100's	

NOTE: Outside of the staple articles, supplies should not be purchased too far in advance, as the quantity used will vary as the work progresses.

TABLE #4.

MEASUREMENTS FOR CONSTRUCTION
OF
BILTMORE RULE.

Diameter Breast High	Distance from eye to tree in inches. 23	24	25	26	27
	Actual distance to be marked on stick in inches.				
6 in.	5.29	5.31	5.34	5.36	5.38
8	6.82	6.85	6.90	6.93	6.96
10 ----------	8.26	8.31	8.36	8.41	8.46
12	9.67	9.69	9.76	9.83	9.89
14	10.92	11.01	11.09	11.17	11.25
16	12.15	12.26	12.36	12.46	12.56
18	13.34	13.47	13.59	13.70	13.81
20 ----------	14.46	14.61	14.75	14.89	15.02
22	15.55	15.72	15.89	16.05	16.19
24	16.60	16.79	16.95	17.11	17.30
26	17.62	17.82	17.99	18.20	18.38
28	18.59	18.82	19.04	19.24	19.44
30 ----------	19.55	19.79	20.02	20.24	20.46
32	20.47	20.72	20.97	21.21	21.45
34	21.36	21.64	21.91	22.16	22.42
36	22.23	22.52	22.81	23.08	23.35
38	23.07	23.36	23.69	23.99	24.27
40 ----------	23.91	24.24	24.56	24.86	25.16
42	24.71	25.05	25.38	25.71	26.03
44	25.50	25.87	26.23	26.55	26.89
46	26.26	26.65	27.01	27.36	27.72
48	27.01	27.41	27.80	28.17	28.54
50 ----------	27.76	28.18	28.57	28.96	29.34
52	28.48	28.91	29.32	29.72	30.11
54	29.18	29.63	30.06	30.48	30.89
56	29.88	30.35	30.79	31.22	31.64
58	30.56	31.04	31.49	31.94	32.38
60	31.23	31.73	32.20	32.67	33.12

From "Notes on the Biltmore Stick" by Donald Bruce,
Proceedings of The Society of American Foresters, Vol. IX.
No. 1, Jan. 1914.

TABLE #5.

WESTERN YELLOW PINE VOLUME TABLE.

Number of Logs in Tree.

DBH	1	2	3	4	5	6	7	8	9	10	11	12	Top DIB
10	4	7											7
12	4	8	15										8
14	5	10	17										8
16	6	12	19	27									8
18	7	14	23	32	41								8
20	9	18	29	38	48	58							9
22	11	24	35	46	58	71	84						9
24	15	30	44	57	71	86	102						9
26	20	39	55	70	87	104	123	143					10
28	26	48	68	86	106	126	146	169					10
30	35	60	83	105	128	150	172	196	230				10
32		72	100	125	152	176	201	230	260				10
34		86	119	148	176	200	230	260	290	330			11
36		110	140	170	200	230	260	290	330	360			11
38			170	200	230	260	290	330	360	400	450		11
40			200	230	260	290	330	370	400	450	500		11
42			240	270	300	330	370	410	450	500	550		11
44				300	330	370	410	450	500	550	600	660	12
46				330	370	420	450	500	550	610	660	710	12
48				360	420	470	500	550	610	660	720	770	12
50					470	520	560	610	660	720	780	830	12
52					520	570	610	670	720	780	840	890	12
54					570	630	670	730	780.	850	910	960	12
56						690	730	790	850	920	980	1040	12
58						750	790	860	920	990	1060	1130	12
60						790	860	920	990	1070	1150	1230	13
62							920	980	1060	1150	1240	1340	13
64							980	1060	1130	1230	1340	1450	13
66							1060	1130	1210	1320	1440	1570	13
68								1200	1300	1410	1550	1690	13
70								1280	1390	1500	1660	1820	14
72								1360	1480	1600	1770	1950	
74										1700	1880	2090	
76										1800	1990	2230	
78													
80													

From U.S. Forest Service records based on 2,396 trees from the Lassen, Plumas, Sequoia, Shasta, Stanislaus and Trinity National Forests, California. 1909-1911. Districts 5, (form 874 -) Scribner Decimal C.

TABLE #6.

Total Bark Surface for Each Diameter and Height.

Diameter Breast High (Inches)	Height of Trees in Feet.																		
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
	Total Bark Surface in Square Feet.																			
2	5	7	9																	
4	10	14	19	24	29															
6	16	21	28	36	44	51	59													
8	21	28	38	48	58	69	79	90												
10	26	35	47	60	73	86	99	112	125											
12	31	42	57	72	87	103	118	134	150	166										
14	37	49	66	84	102	120	138	156	175	193										
16	42	56	76	96	116	137	158	179	200	221	242									
18	47	63	85	108	131	154	178	201	225	248	272	295								
20		70	95	120	146	171	197	224	250	276	302	328	354	380	406					
22		77	104	132	160	189	217	246	275	304	332	361	389	418	448	477				
24		84	113	144	175	206	237	269	300	331	363	394	425	457	489	519	551	583		
26			123	156	189	223	257	292	325	359	393	426	460	494	529	563	597	632		
28			132	168	204	240	277	314	350	386	424	459	496	533	569	605	643	679		
30				180	219	257	296	336	375	414	454	492	532	571	610	650	689	728		
32				192	233	275	316	359	400	441	484	525	566	608	651	692	735	776	818	
34				204	248	292	336	381	425	470	514	558	602	647	692	737	781	826	870	
36					262	309	355	404	450	497	544	591	638	684	734	780	826	873	921	
38					277	326	375	426	475	525	574	624	673	723	774	823	873	922	972	1021
40						344	395	448	500	552	605	656	709	760	815	866	919	971	1025	1032
42						361	415	471	525	569	635	689	744	798	855	910	965	1020	1073	1129
44						378	434	493	550	607	665	721	779	836	896	953	1011	1069	1127	1182
46							454	515	575	635	695	754	814	874	936	997	1058	1116	1177	1238
48							474	538	600	662	725	787	849	912	976	1039	1114	1178	1239	1301
50								560	625	690	755	820	885	950	1018	1082	1148	1213	1279	1344
52								582	650	718	785	853	920	989	1059	1128	1194	1261	1331	1400
54								605	675	745	816	885	955	1026	1099	1170	1240	1311	1382	1452
56									700	772	846	918	991	1064	1140	1213	1287	1360	1433	1508
58									725	800	876	951	1028	1103	1181	1259	1334	1410	1487	1560

TABLE NO. 6.

BARK SURFACE IN SQUARE FEET.

BY AVERAGE DIAMETERS AND INFESTED LENGTHS.

| Average or Middle Diameters (inches) | INFESTED LENGTHS IN FEET. | | |

SAMPLE FORMS.

TREE DATA CARD

(Front side)

Perforated Tab For Binding

Project Area ..... Unit ..... Tree No. .....

Killed by .....
Year ..... { Summer brood .....
Winter brood .....

Location .....
Forty ... Sec. ... T. ... R. ....
Owner .....

	D.B.	D.M.	Ips	
Attack				
Parent adults				
Eggs				
Larvae 0-.5				
Larvae .5-1				
Pupae				
New adults				
Emerging				
Abandoned				
Infested 1'th				

FOLIAGE
Green
Fading
Sorrel
Red
Black

Yellow Pine
Sugar pine
.....
D.B.H.
No.16-ft.Logs
B.F.

Remarks:

Date ..... Camp No. .....
Spotter .....

(Back)

Perforated Tab For Binding

CONTROL DATA

Date of felling _____ Date of treating _____
Infested length _____ Dia. at base ____ Dia. at top _____

Method of Treatment:-

Tree	Brush	Log	Bark	Insects
Left stand	Left on	Laid flat	Left on	Burned
Felled	Trimmed	Off ground	Peeled ¼	Suncured
	Piled	Rolled	" ½	
	Spread		" all	

Size of Crew Treating time _____ man mins.
Remarks:-

Crew Foreman _____

(Size of card 3" x 5 ")

TREATING RECORD.

Project Area_____ Unit_____ Camp No._____

Date_____ Spotter _____ T.____ R.____ Sec.____

Acres Spotted_____ Treated_____ Owner_____ Forty_____

Tree No.	Tree Specie	Killed By	Dia B.H.	No. Logs	Volume B.M.	Diameter Base	Diameter Top	Inf L'th	Bark Sq.ft.	Time No. Men	Time Man Min	REMARKS

TREATING PLAT.

Project Area_____Unit_____Camp No._____

Date_____ Compassman_____T._____ R._____Sec.____

REMARKS:_____

PROGRESS REPORT

Project Area_____ Unit_____ Camp No._____

Report For Period_____ to_____ In Charge_____

TREATED

Location or Crews	Trees	Scale and Owner			Bark Surface	Acres
		U.S.	Private			
Total this period						
Brought forward						
Total to date						

Men In Camp	No. Men	Man Days
Supt.		
Spotters		
Compassmen		
Cooks		
Cook's helpers		
Truck drivers		
Saw filers		
Treaters		
Others		
TOTAL		
Total Meals		

Averages For Period.

Trees treated per man day	
Volume treated per man day	
Bark surface treated per man day	
Acres treated per man day	

REMARKS:

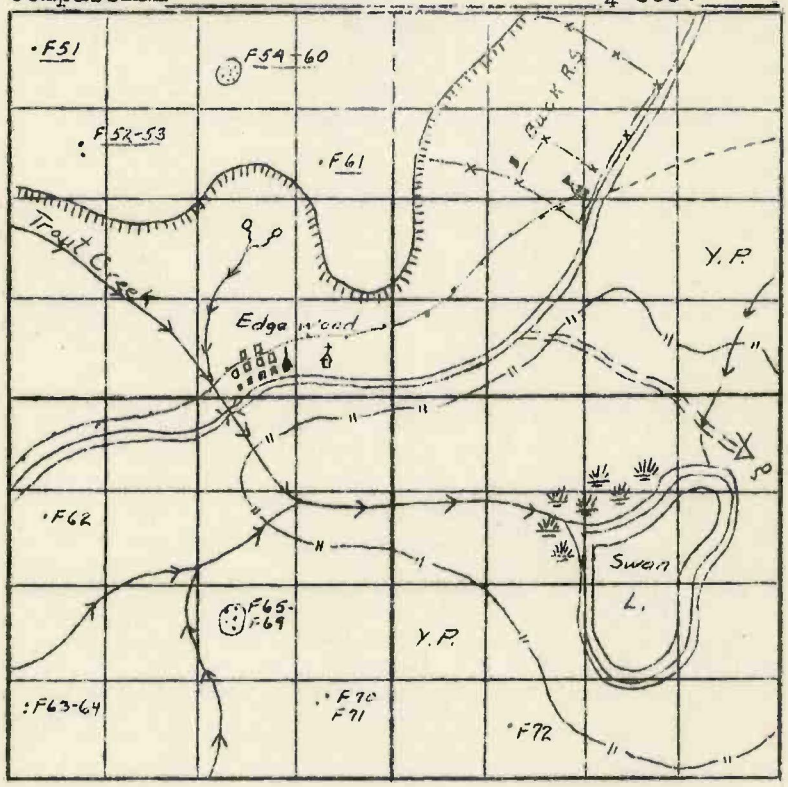
SAMPLE

SECTION PLAT

Project Area 3 Unit B1y Camp No. 16

Date 5/16/23 T. 37E R. 2 S Sec. 7

Compassman T. L. Jones ¼ Sec. —



MAP LEGEND.

Yellow Pine
Untreated · F 71
Treated · F51

Letter indicates year of attack.
Number is serial number of insect killed tree.

Roads (primary)		Streams (live)	
Roads (secondary)		Streams (dry)	
Trails		Lakes	
Buildings		Springs	
Schools		Marsh	
Churchs		Cliffs	
Good camp sites	X	Type boundary	
Telephone lines		Fences	

I N D E X

	PAGE
Administration	1, 2,19
Area Manager	2
Axes	13
Barking spuds	13
Bark Surface Tables	16,33,34
"Bedding"	9
Beneficial Insects	10
Biltmore rule	8,31
Board of Directors	2
Bonus systems	18
Burning method	1,9 ,10,11
Brush disposal	10
Camp equipment	16,22
Camp foreman	4
Camp laborers	3
Camp location	4
Camp organization	2,21
Camp personnel	4
Camps, size of	2
Carborundum stones	14
Communication	2,19
Compass	4
Compassman	5
Compassman's equipment	8
Compassman's plats	15,37,39
Control, administration	2
Control, Methods	1, 9,10
Control period	12
Cook	5
Cooking outfits	17
Cook stove	17
Cook tent	17
Cost Accounting	2
Cost records	15
Crews, spotting	3, 5, 6, 7
Crews, treating	3, 5,12

PAGE

Equipment ---------- 2, 8,13,16,22
Equipment, camp ----------16,22
Equipment, compassman ---------- 8
Equipment, kitchen ----------25
Equipment, spotters ---------- 8,23
Equipment, table ----------26
Equipment, treating crew ---------- -------13,23
Emery wheels ----------17
Entomological supervision ---------- 1, 2, 4, 7,20
Entrance holes ---------- 7
Examining trees ---------- 7

Fading foliage ---------- 7
Fall work ----------11
Felling ---------- 9
Files ----------14
Fires, control ----------10,11
Fire line ----------10
Fire rakes ----------14
Foreman, camp ---------- 4
Forms, sample ----------35,36,37,38,39
Frass ---------- 7

Grindstone ----------17

Infested trees ---------- 7
Intensity of infestation ---------- 4, 6,12,21

Kitchen, equipment ----------25

Laborers ---------- 3, 5,12
Limbing ----------9
Location of camps ---------- 4
Lunches ----------18

Maps ----------15
Mapping 5, 6
Marking trees ---------- 4, 5, 6, 7, 8
Meals ----------15,18
Methods, control ---------- 1, 9,10
Motor trucks ----------19

Organization, camp ---------- 2
Organization, project ---------- 1
Office supplies ----------24

PAGE

Pacing ---------- 6
Pack-stock ----------19
Peeling ----------10,11
Personnel, camp ---------- 4
Pitch tubes ---------- 7
Plan of work ---------- 2,20
Predaceous insects ----------10
Progress maps ----------15
Progress report ----------38
Project organization ---------- 1

Rakes ----------14
Rations ----------27
Records ----------14,15
Record box ----------18

Saws ----------13
Sawdust ---------- 7
Saw filer ---------- 5
Seasons, control ----------11
Section plat ----------39
Selecting trees ---------- 7
Selective logging ---------- 1
Shovels ----------14
Size of camp ---------- 3,20,21
Size of spotting crew ---------- 6, 7
Size of treating crew ---------- 12
Slash disposal ---------- 2,10
Sledge ----------14
Solar heat ---------- 9,11
Sorrel foliage ---------- 7
Special crews ----------10,12
Spotters ---------- 4, 5, 6,11
Spotters equipment ---------- 8,23
Spotting ---------- 5
Spotting crews ---------- 3, 6
Spotting records ----------15
Spotting supplies ----------24
Spring work ----------12
Spuds ----------13
Standard camp ---------- 4,16
Stoves ----------17
Strip, method ---------- 5, 6, 7
Stump ----------10
Subsistence ----------18
Subsistence supplies ----------27
Summer work ----------11

PAGE

Sun curing ---------- 9,11
Supervidion, control ---------- 2
Supervision, spotting ---------- 7
Supplies, distribution ---------- 2
Supplies, office and spotting ----------24
Supply list ----------18,27

Table, bark surface ----------33,34
Table, equipment ---------- ----------26
Table, camp equipment ----------22
Table, size of camps ----------21
Table, standard ration ----------27
Table, volume ----------16,32
Tally ---------- 6
Teams ----------19
Telephone ----------19
Tents ----------16
Time slips ----------15
Time to work ----------11
Topographic spotting ---------- 5
Tops ---------- 9,10
Transportation ----------12,19
Treating ---------- 9
Treating crew ----------12
Treating crew equipment ---------- ----------13,23
Treating, plat ----------37
Treating records ----------15,36
Tree data card ----------14,35

Ventilating holes ---------- 7
Volume tables ----------16,32

Wages ---------- 2,18
Walking distance ---------- 4, 5
Wedges ----------14
Western pine beetle ---------- 1, 7, 8
Windfalls ---------- 8
Winter work ----------12
Woodpecker work ---------- --------- 7
Working seasons ----------11